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ABSTRACT

Educational experiences can now be an important element for people who want to obtain a college degree but were unable to because of the limited structure of traditional schools. This can be achieved through the nonresidential school in higher education that emphasizes student-environment interaction. If the nonresidential school is to be a successful alternative to the traditional college campus, the method of representing knowledge for student consumption must reflect advancements in instructional psychology. This approach would require the development of a large body of high-quality curriculum materials known as courseware, and the redefinition of the role of the teacher as a subject-matter expert involved with developing the courseware. With the subject-matter expert at the head, a team would be organized to develop courseware products that exhibit both efficiency in student time and effectiveness in amount learned and retained. Like the correspondence schools, a student would receive most of his course materials through the mail. A typical package contains a considerable amount of exposition, illustrated by diagrams where necessary. Unit tests and assignments completed by the student are sent to the school to be machine marked or to a correspondence tutor to be personally checked and returned to students. (Author/HS)

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THE REPRESENTATION OF KNOWLEDGE IN WRITTEN INSTRUCTION FOR NON-RESIDENTIAL STUDENTS IN HIGHER EDUCATION

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AERA Paper

The non-residential school in higher education which emphasizes student-environment interaction has altered the historical teacher-students interactive instructional system. Educational experiences can now be an important element for people who want to obtain a college degree but were unable because of the limited structure of traditional schools. The flexibility of the non-residential system will offer the opportunity "to acquire additional knowledge, develop a skill, test an interest, enlarge an awareness, expand a horizon," on a schedule that stops when they have had enough. The instructional system of any educational institution is the process of transmitting knowledge. If the non-residential school is to be a successful alternative to the traditional college campus, the method of representing knowledge for student consumption must reflect advancements in instructional psychology.

This approach would require the development of a large body of high quality curriculum materials, referred to here as courseware. The development of courseware in the non-residential school is not a question of replacing the teacher completely but of redefining his role and creating new roles for him and others in the system. A new major role of the teacher would be that of a subject matter expert involved with developing the courseware. A developmental team would include the subject matter expert, an instructional designer, media and design expert, other subject matter developers (this would depend on the size of the courseware development), and technical assistants, e.g., computer programers, evaluation

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specialists, other specialized media personnel, etc. This type of instructional team has produced continuous, large-scale developmental success in education. To have courseware products that exhibit both efficiency in student time and effectiveness in amount learned and retained requires a highly organized and specialized developmental team. I am convinced that a new technology of courseware design is rapidly developing which provides quality control of production at costs suitable for mass dissemination. That means that the instructional system can be designed for a substantial block of students so that the roles of professors are redefined and possibly reduced as the system becomes more technically intensive and less labor intensive.

Developmental programs in higher education have been relatively unsuccessful in accomplishing efficiency and effectiveness of learning because of two major problems: (a) the erroneous cost of hardware; and (b) the ineffectual procedures used to develop the courseware. Too often hardware costs have been unattractive, regardless of the effectiveness of the program in terms of reducing the costs in education. There have been recent advances in some areas of CAI and audio-tutorial systems which make the cost effective when amortized over a number of years and with a large number of students; this puts the operation in the financial category as more conventional types of instruction. Hardware costs are reduced when the students use some sources outside of the university. Bunderson and Merrill at Brigham Young University are developing interactive CAI controlled junior college English and math courses that can be transmitted over cable to home television. Their cost estimates reduce the per student cost within the junior college by one-third, while home use would reduce the cost to the school by two-thirds. Their system

provides learner control of the instructional material with interactive feedback not found in traditional home television courses or in onsite ITV courses within colleges. Interactive courseware-hardware development using principles of instructional psychology such as this example would add to the flexibility of written instruction for the non-residential school. Early attempts at programed instruction suffered a premature commercialization characterized by a flood of ineffective and poor quality materials. Textbooks were written which followed a single frame format which was both cryptic in knowledge representation and also critically received by the students because of its lack of motivational characteristics. Standards for the design, development, and validation of courseware products are being established and programed instruction, extension courses, and non-residential schools are slowly coming out of the initial experimental shock stage.

Instructional design systems emphasize the importance of specifying learner outcomes, performing task analyses, developing learner activities, constructing mastery tests, and revising program content and directions. When using these components the writer of the instructional materials has to keep in mind that the first step is to define the necessary behavior the student is to have at the completion of the course. By doing this, he has to define how to teach that particular objective. Usually the student is not approaching the subject matter in a way that requires complete understanding of the terminology of the discipline. Thus it forces the subject matter expert to write the instruction in such a manner that communicates without excessive overload on the student. The teacher in the non-residential school is no longer available for individual consultation or for answering questions which often are related to "please redefine in simpler language what you have just stated." And

so the course developer has to design instruction that identifies the relevant components of the discipline without the corresponding rhetoric that is associated with it. This does not eliminate in-depth understanding of the discipline on the students' part, however, it does imply re-evaluation of what the students actually need to know to perform at standard criteria. The most important component of instructional design is the selection of procedures for developing the courseware. Recent research (Tennyson, Woolley, and Merrill, 1972) activities have identified variables used for instructing concept acquisition. Bunderson (1972) is applying these and other empirically validated components in the development of written instruction for higher education mathematics course and has found that this procedure has cut away numerous topics which for years have been taught because of tradition rather than instructional merit. Such design methodology may lead to important simplifications and reconceptualizations which could actually represent a theoretical contribution to knowledge.

Basic learning activities for written instruction of the non-residential school should now be described and illustrated. Like the correspondence schools, the student receives most of his course materials through the mail. Each package probably contains about four weeks work. The difference of this material with the conventional lock-step instructional system is the self-pacing design of the content, which is criterion-referenced. A typical package contains a considerable amount of exposition, illustrated by diagrams or pictures where necessary. To assist the student in assimilating the content, there are self-assessment exercises. Unit tests and/or assignments which are completed by the student are sent to the school to be machine marked by a document reader linked to a computer or to a correspondence tutor to be personally checked and returned to students.

The unique difference between the non-resident university and the correspondence school is the interactive potential of the student with the surrounding environment. Units may include special materials such as glossaries, remedial or enrichment material, television or radio schedules, slide-tape presentations or experiment instructions. Many of these hardware components could be located in regional centers for easy check out. For example, in two individualized courses at Florida State University using an audio-tutorial system, a majority of the students requested that they be allowed to take the slide-tape units home for study.

An example of a school using the above described instructional system of self-contained packages is the Department of Education at Weber State College (Utah). The basic undergraduate curriculum for elementary and secondary teacher education was divided into 90 units. The credits per unit varied from one to four, with no time limit for completion. The WILKIT (Weber State Individualized Learning Kit) was developed following the instructional design system described above. The WILKIT contained in each unit about six to ten "experiences" which formed the basis of the course. The experiences included such events as these: designated reading assignments, observation in specified classroom situations, visits to particular community institutions under specified circumstances, meetings with subject matter experts in the geographic areas, trial teaching of a particular concept, construction of a relief map, collecting species of flora and fauna, etc. This concept has redefined teacher education, that is, instead of learning about teaching, while sitting in a classroom, the student is the teaching environment from the beginning; interacting the written instruction with the actual on the job experiences. There are other examples that show when instructional design is applied the content is radically changed.

This paper presented a brief summary of the use of instructional psychology in courseware development for non-residential higher education. If this approach to education is to be successful, the design of the courseware must be an important step in the process. As stated, ineffective methods of course development would probably have little effect upon the instructional dissemination process. In time the fad and the newness of the new approach would wear off and education would be back into the situation it is now. But by incorporating the components of instructional psychology, this problem could be successfully controlled.

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